**7 Carron Shankland**

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Kat - This is the Suffrage Science podcast: How women are changing science, brought to you by the MRC London Institute of Medical Sciences. I’m Kat Arney and over the coming series we’ll be exploring the journeys of women in science - reflecting on progress we’ve made and the challenges still to be addressed - through conversations with an incredible group of women scientific leaders, who have all received one of the Suffrage Science awards over the past ten years.

We’re hearing from inspirational figures from the world of science like former Chief Medical Officer Sally Davies, computing legend Wendy Hall and climate scientist Tamsin Edwards, so make sure you’ve subscribed to the Suffrage Science Podcast through Apple podcasts, Spotify or wherever you get your podcasts so you don’t miss a single episode.

This time I sat down for a chat with Carron Shankland, Professor of Computing Science at the University of Stirling, who received one of the very first Maths and Computing Suffrage Science Awards in 2016, passing it on to Dr Hannah Dee from Aberystwyth University who we’ll be hearing from later in the series.

Carron’s research puts her right at the intersection of not just two disciplines, but several. Working across computer science, maths and biology, she creates computational models of vast biological systems to tackle questions with real-world applications. Such as how does disease happen and spread in the body? And how do our cells respond to cancer therapies?

If her modelling work wasn’t enough, Carron also commits a huge amount of her time to helping advance the careers of women in academia. She’s Chair of the British Computer Society’s Women in Computing Research group, and leads the CygnetS network - a community for those interested in addressing gender equality in computing science - as well as being a member of the Centre for Gender and Feminist Studies and ScienceGrrl, a grassroots network that celebrates women in science.

No wonder she was nominated ‘Scottish Woman of the year’ in 2017 for her services to Science and Technology.

As we’ll hear, Carron has drawn inspiration from women computer scientists like Professor Muffy Calder who received a Suffrage Science Award alongside her in 2016. But when she looked around her field, there just weren’t that many others out there. And that’s a problem.

Carron - Obviously we have a problem with numbers, usually the number of female undergraduates in computing varies between sort of 15 and 25%, if you're very lucky and you know, this is a bad situation to be in, right? Because it means we end up with all sorts of software that doesn't work for the general population. And we get tools that only work for straight white men, as opposed to any other group of society. And, you know, having a diverse team develop these tools. Because I mean, we're all using loads of software now and this software is controlling our lives. So an example that I usually go back to is Apple Health. So when Apple Health was released, they didn't include anything to do with women's health, particularly. So you couldn't, for example, track periods or fertility or anything like that. But also you could look up something like, "what are the symptoms of a heart attack?", But the symptoms of a heart attack are different from men to women. So therefore women's symptoms were being ignored. And you know what you'd like to think that somebody developing that may have said, "oh, maybe women might want to monitor different things in Apple Health". And there've been loads of other examples like that. So we need lots and lots of people in the different fields, from different fields in an interdisciplinary way, but from different sectors of society to build the systems that we're looking at, because otherwise we're going to get landed with systems designed by a very small group of people. And you know, it's not their fault that they don't look at the other sectors of society. I mean, they could, but it's quite difficult to put yourself in other people's shoes. Yeah. So that's why I think that it's really important to have more diversity in my field. And I was trying to get a UK-wide network set up for computer science, because I think partly we're just not very good at thinking about the cultural aspect of our subject. We're a little bit inclined to say "oh well, how you program is just, it's an entirely mathematical rational thing and therefore the kind of person that you are has no relevance". And I think we've kind of believed that for a long time and it's not true.

Kat - So let's go back to the start of your journey; did you always want to be in this kind of field? Was there something specific that really sparked your interest in this area?

Carron - What sparked my interest was my dad was quite keen for me to get into computers and I'm going to reveal something about my age here, which is that when I was a teenager, it was when personal computers were really just coming in and becoming more accessible for -, I was going to say a wider population - I don't even mean that. I mean, for anybody who's not a computer science geek right, and building their own things. So when I was young, my dad got us a VIC-20, I remember buying the computer magazines and typing in the programs and you had to type it all in and then you would record it on a tap because it would record all the ones, it took ages to record the ones and zeros onto the tape in audio, so they could then read them back, it was crazy. But I also remember, we didn't have computing at my school, but there was a computer club, but only the boys went to the computer club. But when I went to university, I was very interested in mathematics and music. And that's what I mainly wanted to do. And I took computing as my third subject because I had liked computing as a teenager. And when I got to university and studied more about computing, I realised I was really good at it actually, which sounds really big headed actually... I can't believe I just said that...

Kat - I think you'll find, you're allowed to say that... You are really good at it!

Carron - Thank you. But you know, I liked the problem solving aspect of it, you know, the kind of puzzle of: you take that real world problem and you decode what the real world interpretation of that and then turn it into some kind of mathematical programmatic representation - code that up, set the machine going, and it does the thing that you wanted. It's fantastic.

Kat - Amazing. And tell me a bit about the kind of work that you're doing now, because I know that you're trying to apply this idea of mathematics and computing to some really complicated systems like, you know, the complicated squishy systems of life.

Carron - Absolutely. So that was something that I got into probably about 20 years ago. We can describe computer systems using formal languages. And that was what I'd been doing up until that point, describing distributed competition. So that's like the protocols that we use to talk on the internet or send email or those sorts of things. So describing those mathematically, and that was nice, but it felt a bit sterile to be honest. And then I met one of my colleagues who is also my best friend, who is a professor of mathematics and she studies disease modelling and mathematics, and we kind of just wanted to work together. And we saw that there was a really close correspondence between the kind of things that I was writing about in computer systems and the kinds of things that she was modelling in mathematical terms. And it was just really interesting, you know, learning another subject. So learn enough about the biology to understand what does it mean when a Prairie dog spreads bubonic plague to another prairie dog? What are the modes of transmission and what do you need to take into account? And what things can you ignore from the real world, but still give you a suitably complex, realistic model that will tell you things about what's the trajectory of the disease, how you might control that disease. You know, I really enjoyed learning about those other topics and then applying the knowledge that I had and the techniques I had to those systems.

Kat - It's amazing that you can figure this out from, you know, the combination of health data, epidemiology, and then applying these models to it. And do you ever find when you're doing this cross-disciplinary research, like what are the challenges there? Because sometimes it feels like computer scientists and biologists and doctors are just all speaking a different language.

Carron - Oh, absolutely. It is an interpersonal relationship thing, largely. So yes, we do speak different languages. And sometimes, you know, I've been to meetings with colleagues where we've been trying to set up an interdisciplinary collaboration and it's felt like one person is speaking Dutch and the other person is speaking Swahili. I don't know, maybe Dutch and Swahili are quite similar. You know what I mean? So two totally different languages, and we couldn't really find a way to make those languages meet up. And that's not about the subject. I think it is about the way those two people interact with each other, whereas in other cases, you meet somebody or you just find that you're both managing to find a way to talk to each other that allows you to communicate about the subject in, I don't know, some kind of intermediate language

Kat - And it's like your conceptual framework of how you see the problem, that kind of thing.

Carron - Yeah, absolutely. That just somehow that melds together to allow you to create a shared conceptual framework. Yeah. That's nice. I like that term.

Kat - And along your career, you know, you who has inspired you along your journey, and in turn then who are you trying to inspire and pass on your mentoring, if you want to call it that, to the next generation?

Carron - I'm definitely going to have to mention Muffy Calder. So Muffy Calder was also Suffrage Science Award winner. And she was a lecturer at the University of Glasgow when I was an undergraduate. And it was just amazing. I think she arrived in the department when I was in third year and she taught us a course that I really liked in third year as well. It was ‘theory of computation’. And, you know, she was just so different from all the beardy blokes in big jumpers. And that was just really refreshing because it was lovely to be able to say, Oh, actually here is somebody who looks like me, that I can relate to more easily. And I did a PhD with Muffy and I was her postdoc for a while and we're still friends today. So, you know, she has been a huge mentor for me and also a person who is an achievable amount ahead of me on the career ladder, you know? So, she was always, you know, as a lecturer, you know, that was somebody as an undergraduate, I could say actually that looks quite good, it looks like, and I think I could get there, I could get to be a lecturer. Obviously we slightly diverged now that she's Professor Dame Muffy Calder…

Kat - A bit stratospheric!

Carron - I think that's not going to happen, but yeah, so she was massively important as an early role model. I had somebody the other day, one of my students, the other day, I'm teaching second year, just now, and she said, it's really cool to have a female prof. And I was like, that's so nice. You know, because it's difficult to be a woman in computing. I think it is difficult to go into a classroom and see that you are one in five and to not see other faces in that room that look like you. And I think to have those examples in front of you that are lecturers, that's really important. So yeah, I hope that I'm inspiring my students to continue doing computing. I mean, I would like to be, in some ways, more broadly inspirational, right. I would like to be able to visit every school and say computing's brilliant, but I just don't have the time for that. So, you know, you can only do so many things.

Kat - So let's, let's take a look specifically at the Suffrage Science Award. How did it feel to be nominated for this award and also to get this piece of jewellery? Were you expecting it? What did you think when they're like, Oh, you've got this thing, here you go.

Carron - No. Well, it's interesting because, in my role with the BCS, I had been engaged in conversation with the team at Suffrage Science, because we were talking about how can the BCS support Suffrage Science. So I knew quite a lot about it. I thought what an amazing scheme, you know, to be giving out these awards. And I thought it was really exciting. And then one of the team said, "sorry, I can't talk to you about this anymore" and I was like, well, that's interesting. And then I got the email that said, congratulations, you've been nominated. And honestly I'm afraid, in a very cheesy way, I just burst into tears. Right. Because it was just so lovely. I mean, I was at a really low point in my life as well. So that point when I was struggling, the most was also the point when I got nominated for this award. And so it was really amazing to be nominated and to feel like somebody had noticed what I was doing and thought it was good. Yeah. It was great. And it also made me feel like, great, I'm totally going to change the situation though. I did feel a bit more fired up and more like I'd been given a license to be even more enthusiastic about women in computing. And I felt a bit more of a responsibility to do more about women in computing. And I really enjoyed it, so I did have, you know, special occasions when I would wear it out and about and I felt like, like I had a responsibility to go and share this to say, "look, I got this, or you could get this too". And it's nice when people ask you about it and you can say, "Oh, there's this really cool scheme." And you can talk about the other fields as well. Because obviously there's the biology and the physical sciences as well. So yeah, that was really good.

Kat - And who did you have to pass it onto? Who did you choose and why?

Carron - I passed it onto Hannah Dee from Aberystwyth university. Hannah has been so prominent in UK computer science, working for gender equality and creating opportunities for women in computing. So Hannah founded the Lovelace Colloquium, which is an annual conference for undergraduate and taught postgraduate women in computing. And it comes from that observation that I made earlier, that if you walk into that classroom and you're one of a very small number of women, you can feel very lonely. But when you get together with all the other women in the UK who are also studying computing, you're like, Oh, there are other women who did my subject. That's fantastic. And that's, so that's a really nice thing to do. Yeah. She's just amazing.

Kat: We’ll come back to Carron Shankland soon, but now it’s time to hear a few words of advice from another Suffrage Science awardee, computer scientist and educator Sue Sentance.

Sue - And the best piece of advice I've ever received was from Professor Sharon Gewirtz . And she told me to write less, but to write better papers. To focus on quality rather than quantity. And this of course, probably if you're listening, seems glaringly obvious, but for me at the time, I'd come back to academia after working in teaching and I was really focused on just getting out lots of pretty average papers and this timely piece of advice really made a difference.

Kat - If you’re enjoying this series of the Suffrage Science podcast, please do rate and review us on Apple podcasts, and make sure you’re following on Apple podcasts, Spotify or wherever you get your pods, so you don’t miss a single e pisode. Let’s return to our conversation with Carron Shankland, to find out more about the people who have supported her along her career in science.

Carron - The other person that I think is inspirational actually is somebody who was a professor at Heriot-Watt University, Greg Michaelson. And he is inspirational because he is a genuinely nice and decent bloke. And, you know, that's really important. Sometimes academia can be really a bit cutthroat and people could be prepared to trample over other folk and Greg wasn't that person at all. And also Greg was very open about having had mental health problems. And I really admired that about him. And so when I had my own mental health problems, I really took inspiration from Greg. And one of the things I'm really passionate about now is talking to anyone who will listen actually about depression basically, and stress and overwork and how we often do these things to ourselves and how we're really the only person that can get ourselves out of that. But that we do that with the support of others... that having others to just... So many times, you walk past a colleague in the corridor and you know, you're both in a hurry and you say, "how are you? " "Oh fine". And then, you know, you both kind of say this simultaneously and walk off and neither one of you might be fine, but we're not really well conditioned to being honest about that. So I think things are changing actually. So Greg has really inspired me to be more open about mental health. And one of the things that I do do is I do quite a lot of talks about mental health.

Kat - I think it's so important. I do a lot of careers talks, for sort of undergrads and students, and in my twenties, when I was leaving the lab, my career in the lab, I was very depressed. I was really unhappy and just feeling like a massive failure, because I was clearly not cut out for actual lab science. And it's so important to stand up and say that and say like, you can feel like absolute rubbish and this happens, and it's important to know that you can change and you can do things about it. I think it's really, really important.

Carron - But also that it doesn't define you as a person, right. So, because you're not good at lab science, you're amazing at what you do do, but you wouldn't have known that if you hadn't made the change from lab science. Right.

Kat - Exactly. I'm also very, very clumsy. So it's probably best to...

Carron - I can see that that's not so good in lab science, yes.

Kat - So we've talked about the fact that there are fewer women in computing science. It's a numbers game, but there are also broader issues of diversity in the fields. You know, what do we need to do to make this change, to make science, technology computing more inclusive.

Carron - So that is another really big question. And I think we are making changes, I think for computing, I think part of the problem is that we're not really sure what it is that we're doing that's turning women off. And I think in some ways I struggle with this because I'm a woman who went into computing and so, clearly, whatever the things are that put other women off, I don't see them for some reason. So I'm kind of not the right person to ask in some ways. So that really says to me, we need to get more evidence and we need to get a really broad evidence base. And what I kind of worry about is, you know, there are lots of universities and colleges and schools that are engaged in outreach activities, but we don't really know which of those are actually effective and largely that's because we have small numbers involved in each. So I don't know if I go to visit a school locally and I talk to a class of primary school kids: will one of them apply to do computing in 10 years time? Well, I don't really know because they may apply to my university and I might be able to capture that, but you know there are a lot of other universities, they could go anywhere. So I think we need a kind of national framework for collecting evidence and for using outreach activities. So if we kind of made those activities a bit more standardised and worked together, because you know, we are a little bit competing with each other right now for students to our university. But actually this is a problem that's kind of bigger than us. It's bigger than our own departments that getting more women into the subject is something that we all have to tackle together. So I think some of it comes down to social perceptions of what does a computer scientist look like. So we can tackle that from one end by making sure we have plenty of exemplars of the diversity of what computer scientists look like. But we're also not that brilliant at communicating what computer scientists do. Right. So when kids say "I want to be a doctor when I grow up, then everybody has a sort of idea of what a doctor might look like, but I'm not sure anybody says "I want to be a computer scientist when I grow up".

Kat - Yeah. Is it like coding or maths or I don't know, like IT support?

Carron - It could be all of those things, you know, that is the thing, right. So some of it is like maths and some of it is like coding, but some of it's talking to people about what kind of system they need in the first place so that you can design a good system. Some of it is about designing user interfaces. We can talk about a lot of different fields. So I think we've not been brilliant as a subject at telling the world about what it is that we do. But for example, there was a great article this week in The Scotsman that Muffy Calder wrote to say 'here are the things that computing has done to tackle Covid'. And that was good because you know, those things that are a bit hidden right? So we see the, the people developing the vaccine and we see the people that worked for the NHS that are looking after people who are sick, but all of the things that computer science has contributed to us being able to get through lockdown, the fact that we are doing this interview right now, you know, all the technology that we're using, that's keeping life going. I had to take all my university teaching and put it online. You know what I just couldn't have done that 10 years ago because the technology wasn't there to do it reliably.

Kat - I think it's been phenomenal. Yeah. Some of the people that I work with, some of the organisations are in the health data area. You know, I'm working with the company Zoe that does the COVID symptom study app. And just the way that we've been able to use apps, data science, to get really incredible insights and be able to do it at scale, you know, get a million people giving their health data or being able - thinking about things like the clinical trials that have pulled the health data from health records to, you know, to stop doctors and nurses having to ask people like all this information it's just there in the health records, you can pull it out. I think it's, it's so exciting.

Carron - Yeah. And you know, we really - it feels like we're on the cusp of totally revolutionising society and, you know, computer science is underneath all of that. Yay for computing science.

Kat - Thanks very much to Carron Shankland, and apologies if you noticed the delicate strains of music in the background at the end - that’s Carron’s partner teaching string lessons online. We’ve been recording these interviews during the UK lockdown in early 2021, so life sometimes gets in the way.

Next time I’ll be speaking with Hayaatun Sillem about her unusual career journey from being a cancer researcher to the first female CEO of the Royal Academy of Engineering.

Hayaatun -So if you do know that you want t o stay in life in say academic research, you do have a sense of, what you have to do to progress as soon as that's gone, actually that's part of your professional identity that's gone. And working out what is good for me, you know, what, actually is going to deliver fulfilment and success or happiness or whatever it is you're looking for in your career is I think genuinely one of the hardest questions to answer

Kat - And before we go, here’s a final word from computer scientist and Suffrage Science awardee Hannah Dee about her hopes for the future for women in computing.

Hannah - I think what I'd really like to see change is the ratio. It's very, very strange to be the only woman in the room and we're still 10% or 15% or whatever. If you're in a meeting of just 10 people, which is not that unusual chances are, you're going to be the only woman there. And that it's just a strange situation to find yourself in. So I'd like to see that change particularly for the younger people. So the undergraduates coming in now, it would be nice to think that they're not going to accidentally end up in a tutorial group where there's just one girl, for example, because it just doesn't feel equal then

Kat - The Suffrage Science Podcast: How Women Are Changing Science is presented by me, Kat Arney, with audio production by Georgia Mills. It is produced by First Create The Media for the MRC London Institute of Medical Sciences Suffrage Science scheme. Find out more and read profiles of previous awardees at [suffragescience.org](https://www.suffragescience.org/) and follow @MRC\_LMS on Twitter and the hashtag #SuffrageScience for all the latest news. Until next time, goodbye.